

## Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit [www.landfire.gov](http://www.landfire.gov). Please direct questions to [helpdesk@landfire.gov](mailto:helpdesk@landfire.gov).

### Potential Natural Vegetation Group (PNVG):

R0SBWYwy

Wyoming Big Sagebrush

### General Information

**Contributors** (additional contributors may be listed under "Model Evolution and Comments")

#### Modelers

Tim Kramer                      Tim\_Kramer@blm.gov

#### Reviewers

Bill Baker                      bakerwl@uwyo.edu  
Don Bedunah                      bedunah@forestry.umt.edu  
Dennis Knight                      dhknight@uwyo.edu

#### Vegetation Type

Shrubland

#### Dominant Species\*

ARTRW8

#### General Model Sources

- Literature  
 Local Data  
 Expert Estimate

#### LANDFIRE Mapping Zones

10	21
19	22
20	29

#### Rapid Assessment Model Zones

- |  |  |
|--|--|
| <input type="checkbox"/> California                | <input type="checkbox"/> Pacific Northwest |
| <input type="checkbox"/> Great Basin               | <input type="checkbox"/> South Central     |
| <input type="checkbox"/> Great Lakes               | <input type="checkbox"/> Southeast         |
| <input type="checkbox"/> Northeast                 | <input type="checkbox"/> S. Appalachians   |
| <input type="checkbox"/> Northern Plains           | <input type="checkbox"/> Southwest         |
| <input checked="" type="checkbox"/> N-Cent.Rockies |  |

### Geographic Range

Wide-ranging PNVG common to Basin and Range province, extending into the Columbia Plateau and east into the northern and central Rockies and the western edge of the short grass prairie.

### Biophysical Site Description

Wyoming big sagebrush occupies foothills, terraces, slopes, plateaus and basin edges. Soils are shallow to moderately deep and well drained. Wyoming Big Sagebrush generally occurs in the 5 - 12 inch precipitation zones. Soil depth and accumulation of snow enhances these communities in lower precipitation zones (Knight 1994)

### Vegetation Description

Wyoming Big Sagebrush is the dominant mid-to late seral species within this plant assemblage. Cool season grasses such as Thurber's needlegrass, Needle-and-thread, Indian ricegrass, Sandberg's bluegrass, squirreltail, rhizomatous wheatgrasses are common species within the Wyoming range of this PNVG. Common forbs are species of Astragalus, Crepis, Delphinium, and Phlox, while associated shrubs and shrub-like species can be small green rabbitbrush, black sagebrush, spiny hopsage, and winterfat. Herbaceous species usually dominate the site prior to re-establishment. Site re-establishment is by seed bank, seed production from remnant plants, and seeds from adjacent (untreated) plants.

Wyoming big sagebrush sites have fewer understory species relative to other big sagebrush subspecies, though in the eastern extent of this vegetation community there is a higher potential for herbaceous species.

### Disturbance Description

Many researchers believe fire was the primary disturbance factor within this plant assemblage. Other disturbance factors may include insects, rodents and lagomorphs, drought, wet cycles, gradual changes in

\*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

climate, and grazing (Wyoming Interagency Vegetation Community 2002). Drought, native grazing by large ungulates (e.g., bison), and insects were modeled here and are generally mixed severity.

Following fire or other significant disturbance, herbaceous species will dominate the ecological site post-burning and recovery to 20% canopy cover may take more than 40 years (Young and Evans 1981, Winward 1991). Site re-establishment is by seed bank, seed production from remnant plants, and seeds from adjacent (untreated) plants. Discontinuity of fuels in Wyoming Big Sagebrush communities usually result in mosaic burn patterns, leaving remnant plants for seed (Bushney 1987). Fire does not stimulate germination of soil-stored Wyoming Big Sagebrush, but neither does it inhibit its germination (Chaplin and Winward 1982).

Overall fire return intervals in Wyoming Big Sagebrush appear to have ranged from 10 - 240 years or more (Baker in press, Winward 1991, Bunting et al. 1987, Young and Evans 1981 ). Reviewers for this type disagreed strongly about average fire return interval, suggesting MFIs of 90-140 years. The majority of reviewers agreed with the model's original 90 year MFI and it was unchanged.

Discontinuity of fuels in Wyoming big sagebrush communities often result in mosaic burn patterns, defined here as mixed-severity fire (25-75% top-kill of sagebrush) (Bushney 1987). However, reviewers disagreed about the role of mixed-severity fire in this system, indicating that it may have dominated the system, not been present at all, or been secondary to replacement fire. The majority of reviewers agreed that it was modeled reasonably at 65% replacement fire and 35% mixed-severity fire. However, all agreed that data on fire severity is sparse (but see Baker, in press).

### Adjacency or Identification Concerns

This type merges into various other PNVGs and may hybridize with mountain sagebrush and basin big sagebrush. Local data show that hybridized species may have more resiliency to prescribed fire than non-hybridized Wyoming big sagebrush (Eve Warren, Wyoming BLM).

Secondary shrub and herbaceous components may vary considerably across the range of its extent. Wyoming big sagebrush sites may abut Juniper, Pinyon-Juniper, ponderosa pine, mountain sagebrush, salt desert shrub and grassland vegetation types across its range.

Annual brome graminoid layers now dominate the herbaceous layers of Wyoming big sagebrush communities. These grasses have created more frequent fire regimes (2-5 year MFI).

Juniper invasion into Wyoming big sagebrush systems may be occurring today. Where this occurs, juniper out competes the sagebrush, and sagebrush cover is reduced.

This PNVG is similar to the PNVG R2SBWese for the Great Basin model zone.

### Scale Description

Sources of Scale Data	<input checked="" type="checkbox"/> Literature	<input checked="" type="checkbox"/> Local Data	<input checked="" type="checkbox"/> Expert Estimate
-----------------------	--	--	---

### Issues/Problems

### Model Evolution and Comments

Workshop code was WYSB. This model was combined with another Rapid Assessment model, ROSBWA (workshop code was WSAG1), modeled by George Soehn (george\_soehn@blm.gov) and reviewed by Sarah Heide (sarah\_heide@blm.gov) and Krista Gollinick-Waid (krista\_waid@blm.gov). The two were combined based on peer-review and the similarity of disturbance regimes and species composition.

Model is based on the original FRCC PNVG (WYSB1) with modifications from Wyoming Interagency

Vegetation Committee (2002) and expert estimates.

Peer review incorporated 4/30/2005. Additional reviewers were Karen Clause (karen.clause@wy.usda.gov), Ken Stinson (ken\_stinson@blm.gov) and Eve Warren (eve\_warren@blm.gov). Reviewers disagreed about the frequency of fire and severity of fire, suggesting MFIs of 90-140 years and no mixed severity fire to 50% mixed severity fire. The majority of reviewers agreed with the original model, however, so the quantitative model was unchanged. Descriptive information was added to capture the disparate opinions of reviewers.

## Succession Classes

*Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).*

### **Class A 20%**

Early1 PostRep

**Description**

Herbaceous dominated. Primarily grasses with forbs. Exact species will vary depending on location. Western wheatgrass, Sandberg bluegrass Indian ricegrass, needle and thread, bluebunch wheatgrass, and blue gramma would be dominant grasses. Forbs may include Astragalus, Crepis, Delphinium, Agoseris, Phlox, and others. There may also be significant component of small green rabbitbrush.

**Indicator Species\* and Canopy Position**

STCO4  
ORHY  
AGSM  
BOGR

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** no data

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	0 %	5 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

### **Class B 30%**

Late1 Closed

**Description**

Sagebrush canopy is greater than 25 percent. All primary components of the herbaceous community are present with significant component of other shrubs. Herbaceous community is dominated by grasses with dominance of species like blue gramma and rhizomic wheatgrasses. This class may dominate on areas with dry alkali soils.

**Indicator Species\* and Canopy Position**

ARTRW8  
OPUNT  
STCO4  
AGSM

**Upper Layer Lifeform**

- Herbaceous
- Shrub
- Tree

**Fuel Model** no data

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	25 %	100 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

\*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

**Class C 25 %**

Mid2 Open

**Description**

Sagebrush canopy is greater than 5 but less than 25 percent.

Understory is well represented by herbaceous species as described for class A.

**Indicator Species\* and Canopy Position**

ARTRW8

STCO4

AGSM

ORHY

**Upper Layer Lifeform**

Herbaceous

Shrub

Tree

**Fuel Model** no data

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	0 %	25 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Class D 25 %**

Late1 Open

**Description**

Sagebrush canopy is greater than 5 but less than 25 percent. All

primary components of the herbaceous community are present with significant component of species such as blue gramma or rhizomic wheatgrasses. There is also a significant component of other shrubs such as cactus and small green rabbitbrush. Fire frequency is limited here due to discontinuous fuels. Herbaceous community is dominated by grasses.

**Indicator Species\* and Canopy Position**

ARTRW8

STCO4

AGSM

OPUNT

**Upper Layer Lifeform**

Herbaceous

Shrub

Tree

**Fuel Model** no data

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	0 %	25 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Class E 0 %**

Late2 Closed

**Description**

**Indicator Species\* and Canopy Position**

**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	%	%
Height	no data	no data
Tree Size Class	no data	

**Upper Layer Lifeform**

Herbaceous

Shrub

Tree

**Fuel Model** no data

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

**Disturbances**

\*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

**Non-Fire Disturbances Modeled**

- Insects/Disease
- Wind/Weather/Stress
- Native Grazing
- Competition
- Other:
- Other:

**Fire Regime Group:      4**

- I: 0-35 year frequency, low and mixed severity
- II: 0-35 year frequency, replacement severity
- III: 35-200 year frequency, low and mixed severity
- IV: 35-200 year frequency, replacement severity
- V: 200+ year frequency, replacement severity

**Historical Fire Size (acres)**

- Avg:
- Min:
- Max:

**Fire Intervals (FI):**

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

**Sources of Fire Regime Data**

- Literature
- Local Data
- Expert Estimate

	<i>Avg FI</i>	<i>Min FI</i>	<i>Max FI</i>	<i>Probability</i>	<i>Percent of All Fires</i>
<i>Replacement</i>	145	80	240	0.0069	63
<i>Mixed</i>	250			0.004	37
<i>Surface</i>					
<i>All Fires</i>	92			0.01091	

**References**

Anderson, J.E. and R.S. Inouye. 2001. Landscape-scale changes in plant species abundance and biodiversity of a sagebrush steppe over 45 years. *Ecological Monographs*. 71(4): 531-556.

Baker, W. L. In press. Fire and restoration of sagebrush ecosystems. *Wildlife Society Bulletin*, in press.

Bunting, S.C., B.M Kilgore and C.L. Bushey. 1987. Guidelines for prescribed burning sagebrush-grass rangelands in the northern Great Basin. USDA For. Ser. Gen. Tech. Rep. INT-231. Ogden, UT.

Fire Regime Condition Class (FRCC) Interagency Handbook Reference Conditions, Modeler: Doug Havlina, Date: 8/15/03, PNVG Code: WSAG1. 2.

Knight, D.H. 1994. *Mountains and Plains*. Yale University Press

Perryman, L., Maier, A.M., Hild, A.L., Olson, R.A. 2001. Demographic characteristics of 3 *Artemisia tridentata* Nutt. Subspecies. *Journal of Range Management*. 54(2):166-170.

Sturges, David L. 1994. High-elevation watershed response to sagebrush control in southcentral Wyoming. Res. Pap. RM-318. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 19 p.

Vale, T.R. 1975. Presettlement vegetation in the sagebrush-grass area of the Intermountain West. *Journal of Range Management*. 28(1):32-36.

Welch, B.L and Bindle, C. 2003. Countering Misinformation Concerning Big Sagebrush. USDA For.Ser.Research Paper. RMRS-RP-40

Winward, A.H. 1991. A renewed commitment to management of sagebrush grasslands. In: *Research in*

\*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

rangeland management. Corvallis, OR:Oregon State University. Ag Exper. St. Special Rep. 880. 7p.

Wyoming Interagency Vegetation Committee. 2002. Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management. Wyoming Game and Fish Department and Wyoming BLM. Cheyenne, WY. 53 pp.

Young, J.A. and R.A. Evans. 1978. Population dynamics after wildfires in sagebrush grasslands. Journal of Range Management. 31:283-289.